Department of Mathematics

College of Science

Salahaddin Univesity-Erbil

Subject: Linear Algebra

Module leader: Dr.Wuria Muhammad Ameen Hussein

Academic Year: 2022-2023 (Semester II)

Course Book

1. Course name	Linear Algebra (II)
2. Lecturer in charge	Dr.Wuria Muhammad Ameen
3. Department/ College	Mathematics/Science
4. Contact	e-mail: wuria.hussein@su.edu.krd Tel:
5. Time (in hours) per week	Theory: 3 Practical: 2
6. Office hours	
7. Course code	
8. Teacher's academic profile	-Name: Wuria Muhammad Ameen Hussein - Place-Date of birth: Erbil-14/2/1971 -Academic title: Lecturer -PhD in Mathematics at Plymouth University-United Kingdom in 2016 -M.Sc. in Mathematics at Salahaddin University in 2002 -B.Sc. in Mathematics at Salahaddin University in 1994 - General field: Mathematics -Specific field: Application of Algebraic Geometry -Job title and address: Lecturer in Mathematics Department/College of Science/Salahaddin University
9. Keywords	Vector space, Linear transformation, inner product space, eigenvalues, diagonalisation.

10. Course overview:

Linear algebra is a branch of mathematics. It deals fundamentally with linear combinations. In linear algebra, we study the theory of matrices, system of linear equations, vector spaces, linear transformations, inner product spaces, orthogonality, diagonalizations, eigenvalues, eigenvectors and some applications. Linear algebra is widely used in the fields of Science, and Engineering.

The aim of this course is to involve the concept of vector spaces in other topics such as linear mappings, inner product spaces and normed vector spaces. Students will be provided with definitions and theoretical tools that are needed to understand various topics in other mathematics branches such as differential equations and functional analysis. We will supply the readers with some applications.

11. Course objective:

This course will cover the following topics:

- Linear transformations.
- Eigenvalues, eigenvectors and orthogonality.
- Inner product spaces and normed vector spaces.
- Coordinate of a vector and change of basis.

12. Student's obligation

1. Students are required to attend each lecture on time, staying and listening until the end. Students can leave the class for a short time if necessary.
2. Students are not allowed to be out of attendance for more than 9 hours.
3. Any discussion among the students during the lectures is not allowed unless they get permission.

13. Forms of teaching

1. We use the slide visualiser if available, otherwise the white board.
2. Data show projector.

14. Assessment scheme

Students are required to get at least %50 in order to pass this module.
The marks are counted as follows:

1- %40 (%30 for theory+%10 for tutorial).
2- %60 for the final exam.

15. Student learning outcome:

دوای ئەوەی قوتابی ئەم کۆرسە دەخوێنێت و بە سەرکەوتوویی تەواوی دەکات، بنچینەییەکی پتەو بە دەست دەهێنێت لەسەر Linear transformation و Inner product space و normed vector space و eigenvectors, eigenvalues و diagonalisations.

ئەو کۆرسە دەست پێدەکات بە خوێندنی بابەتی Linear transformation کە خۆی لە خۆیدا نەخشەیە لە نێوان دوو vector space، وە دوای ئەوە بابەتی eigenvector, eigenvalue و diagonalisations دەخوێندرێت.

Inner product space و normed vector space و orthogonality, دەبێتە بابەتی دوای ئەوە و لە کۆتاییدا coordinate of a vector وchange of basis دەخوێنین.

16. Course Reading List and References:

1. Kolman B. and Hill D. R., Elementary Linear Algebra with Applications (9th edition). Pearson, Prentice Hall, 2008.
2. Kuttler K., A first Course in Linear Algebra (An open text book). By Lyryx, 2017.
3. Lipschutz S.and Lipson M.L., Linear Algebra (Forth edition). Schaum's outline series. McGraw Hill companies. 2009.
4. Nicholson W. K., Linear Algebra with Applications (Third edition). PWS company, Boston, USA, 1990.

Syllabus of Linear Algebra

2022-2023 (Semester II)

Chapter 1: Linear Transformation

1.1 Examples and elementary properties.

1.2 Kernel and image of linear transformation (LT).

1.3 Isomorphism and composition.

1.4 Operation with LT.

1.5 Matrix representation of a linear operator. **Chapter 2: Eigenvalues and diagonalization** 2.1 Eigenvalues and eigenvectors 2.2 Diagonalisation. **Chapter 3: Inner product spaces, Orthogonality** 3.1 Inner product spaces (Definition and examples) 3.2 Normed vector spaces 3.3 Orthogonality 3.4 Orthogonal projection 3.5 Orthogonal projection in $\Re^n$ **Chapter 4: Coordinate of a vector and change of basis** 4.1 Coordinate of a vector 4.2 Change of basis	
18. Practical Topics (If there is any)	

19. Examinations:

1*. Compositional:* In exams, the questions are usually started with: Prove that or prove or disprove, for this type of question, if it is correct, then students must prove it generally. Otherwise he/she must provide a counterexample for disprove.
for example:
Prove or disprove: Any normed vector space is an inner product space.

2. True or false type of questions: In this type, a short sentence about a specific subject will be provided. Then students should comment on the trueness or falseness of this particular sentence. Explanation and examples should be provided.

20. Extra notes:

1. Students should work in groups.
2. Solving examples as much as he/she can.